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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/042,878	01/09/2002	Mark O. Neisser	2002US304	5290

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EXAMINER	
BARRECA, NICOLE M	
ART UNIT	**PAPER NUMBER**
1756	6

DATE MAILED: 07/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/042,878	Applicant(s) NEISSER ET AL.	
	Examiner Nicole M. Barreca	Art Unit 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-26 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-26 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3,4,5.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

1. Claims 1-26 are pending in this application.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 4, 6, 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. The term "substantially free" (of cross-linking, of crosslinking steps, or of undercutting and footing) in claims 4, 6, and 8 (respectively) is a relative term which renders the claims indefinite. The term "substantially free" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Can a small amount of crosslinking or undercutting and footing be present while still meeting the requirement of "substantially free"?

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-6, 8, 12, 14-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Padmanaban (EP 942331).

7. Padmanaban discloses an antireflective coating composition which will not intermix with the overlying photoresist or cause footing (cl.4,8). The antireflective coating will not remain upon developing (i.e. single developer) [0086]. Example 3 teaches forming the antireflective layer synthesized from of 9-anthramethyl methacrylate (cl.12). The bottom antireflective coating is spin coated on a silicon wafer (cl.19) at a thickness of 60 nm after baking at 200 °C for 60 seconds (cl.5,6), followed by the deposition of a positive or negative-working chemically amplified photoresist (cl.2,3). The BARC was formed from a polymer solution having 3 % solids. After the resist is coated, the wafer is soft baked for 60 seconds at 100 °C (cl.14) and exposed to radiation having a wavelength of 248 nm. Exposure may also be conducted at 193 nm, 365 nm or anywhere in the image of 100-500 nm (cl.20-23). Following exposure the wafer was baked at 90 °C for 60 seconds and developed with tetramethylammonium hydroxide solution (cl. 15-18) to form the pattern, which may then be used to etch transfer the image to the substrate. The BARC had n and k values of 1.49 and 0.51. Using the formula of the maximum thickness = $\lambda / 2n$ = (248nm)/2(1.49)= 83 nm. The thickness taught therefore is less than the maximum thickness (60 nm< 83nm), meeting the limitations of claim 1. See [0028], [0042]-[0046], [0059].

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Padmanaban as applied to claim 1 above, and further in view of Hyakutake (US 5,994,006).

Padmanaban explicitly teaches using a 60 nm BARC layer when the overlying photoresist is exposed to 248 nm. Padmanaban also teaches that exposure may also be conducted at 193 nm, 365 nm or anywhere in the image of 100-500 nm and that the thickness of the BARC is in the range of 30-5,000 nm [0028]. Padmanaban does not disclose that the BARC has a maximum coating thickness of about 50 nm for 157 nm and 193 nm exposure, 70 nm for 248 nm and 120 nm for 365 nm. Hyakutake teaches that the thickness of the antireflective layer depends on the wavelength of the exposure light (col.3, 16-18) and is therefore a result-effective variable. It would be within the ordinary skill of one in the art to determine the maximum thickness for the antireflective layer in the method Padmanaban by routine experimentation and to have the maximum thickness be about 50 nm for 157 nm and 193 nm exposure, 70 nm for 248 nm and 120 nm for 365 nm, if required, because Hyakutake teaches that the thickness of the antireflective layer is result effective variable which is dependent on the wavelength of exposure light and the discovery of an optimum value of a result effective variable is ordinary within the skill of the art, as taught by *In re Boesch* (617 F.2d 272, 205 USPQ 215 (CCPA 1980)).

10. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Padamanaban as applied to claim 1 above, and further in view of Puligadda (US 6,323,310).

11. Padamanaban discloses an organic BARC which may additionally include a light absorbing compound. Padamanaban does not disclose that the BARC composition comprises a polymer-bound or nonpolymer-bound dye. Puligadda teaches that BARC compositions typically consist of an organic polymer which provides coating properties and a dye for absorbing light. Puligadda also teaches that the dye is either blended into the composition (nonpolymer-bound) or chemically bounded to the polymer (col.1, 27-33). It would have been obvious to one of ordinary skill in the art to have the BARC composition in the method of Padamanaban comprise a dye because Puligadda teaches that BARC compositions typically consist of an organic polymer which provides coating properties and a dye for absorbing light. It would have also been obvious to one of ordinary skill in the art to have the dye be polymer or nonpolymer bound because Puligadda teaches that dyes are either blended into the composition or chemically bound to the polymer.

12. Claims 24 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Padamanaban as applied to claim 1 above, and further in view of Malik (US 6,312,870).

13. Padamanaban teaches that any known resist may be used with the BARC composition but does not disclose that the photoresist composition comprises an acrylate, methacrylate, or a polyhydroxystyrene polymer. Malik teaches that photoresist compositions containing copolymers of t-butyl acrylate or methacrylate and hydroxystryrene monomers are known in the art (col.1, 17-19). It would have been obvious to one of ordinary skill in the art to use a photoresist composition comprising an

acrylate, methacrylate, or a polyhydroxystyrene polymer in the method of Padamanaban because Malik teaches that photoresist compositions containing copolymers of t-butyl acrylate or methacrylate and hydroxystryrene monomers are known in the art.

14. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Padamanaban as applied to claim 1 above, and further in view of Yoon (US 6,537,727).

15. Padamanaban teaches that any known resist may be used with the BARC composition but does not disclose that the photoresist composition comprises a cycloolefin/maleic anhydride copolymer. Yoon teaches that a cycloolefin/maleic anhydride copolymer is a conventional resist composition (col.1, l.66-col.2, l.4). It would have been obvious to one of ordinary skill in the art to use a photoresist composition comprising a cycloolefin/maleic anhydride copolymer in the method of Padamanaban because Yoon teaches that a cycloolefin/maleic anhydride copolymer is a conventional resist composition.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Padmanaban (US 6,365,322) and Rahman (US 6,447,980) disclose photoresist compositions based on copolymers of methyladamantyl methacrylate and mavalonic lactone methacrylate. Ogoshi (US 5,688,365) discloses an antireflective layer which is not developed with the same solution as the overlying resist but does have a thickness equal to $\lambda/2n$. Yamada (US 6,399,481) discloses a BARC

film whose thickness is equal to $\lambda/4n$. JP 9-260255 discloses a photoresist film overlying an antireflective film, wherein the photoresist film thickness is equal to $\lambda/2n$.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 703-308-7968. The examiner can normally be reached on Monday-Thursday (8:00 am-6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 703-308-2464. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Nicole Barreca
Patent Examiner
Art Unit 1756

June 26, 2003